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VARIABILITY OF *SENECIO VULGARIS* L. WEED FRUIT CHARACTERS

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Abstract
Among the important species to spread in crops is groundsel (Senecio vulgaris L.). Weed stands first several generations in a year, by a high coefficient of multiplication, and induce a high density. To them the necessary measures to establish some of its integrated management were needed some degree of variability. How the plant grows here reflects the specific existent ecotype at a time. From tests carried out showed that the disk had surrendered width of 3.8 mm, ligules total no. was 17, with an average length of 6 mm. In the capitula formed 60 achenes with average sizes of 2.7 mm long and 0.2 mm wide. Pappus measured 5.9 mm length and style fruit was 5.6 mm. Among the characters studied were established simple correlations (r). Some of these were positive:between the disc diameter with achenes dimensions (r = 0.228 for length, and r = 0.232* for width). An-significant negative links were found between the number of achenes/ capitula and achene size (r = -0.064 of length, and r = -0.017 of width). The present study demonstrated the wide possibilities that weed was adapted in the agricultural field, regardless of the crop.*

Keywords*: achenes, capitula, pappus, S. vulgaris, style, variability*

1. INTRODUCTION

Weeds in agricultural fields currently known a new stage in their evolution. With the reduction of chemical control, there is a readjustment to these new conditions. Among the new complex control measures recommended are morphological variability studies. The higher their expression, the plant is better suited. Therefore, for effective new control investigations are needed, that could open new research perspectives. A weed that causes problems is *Senecio vulgaris* L. (birdseed, chickenweed, common groundsel, groundsel, old-man-of-spring, swallow, SENVU code Bayer). The plant spreads easily through adaptation to different lengths of days in all seasons, with several generations per year (usually three). In addition, a plant are formed many flowers, resulting in an impressive number of achenes. Thus, a plant can produce in a year about 2,000 achenes. Fruit of the plant spreads very easily, so using pappus, and through other channels. Therefore, the plant has the attention of the European Weed Research Society (EWRS), ranging in biological control programs. Blooming *S. vulgaris* capitulum (flower head) comprises 10 to 22 tubular flowers of pale yellow. These lengths of 6-13 mm, with black bracts tip placed circular at the base of flower head (figure 1). There is a form of radiant *S. vulgaris* which is the result of cross-polination with *S. squalidus* (Oxford ragwort).

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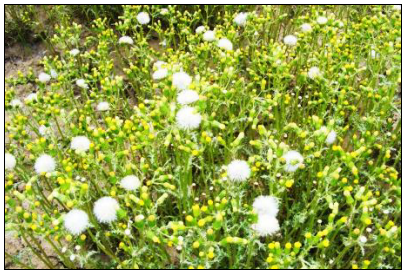

Figure 1. S.vulgaris with flowers and fruits

Figure 2. Achenes with pappus

The weed is annual- biennial, small: 4-60 cm, a lot of leaves, with hairs or glabrous. The stem is juicy, branched upright position or upward forming clumps. Leaves are dense, pinnatifid, little petiole, oblong- spathulate, dentate to short- lobed. Leaf lobes are oblong, sessile, pinna based, remotely denticulate. The flowers are 2.4 mm in diameter, cylindrical, usually grouped in dense corymb, is linear. No radial flowers. Floral disc is 6-7 mm in diameter and involucral bracts are linear, acute, stair edge. Achenes of 2.2 x 0.7 mm are spindly, cost, hairs, adprese, brown. Pappus is longer that the achene, prominent, white and hairy (figure 2). On average weight about 0.2 grams of 1,000 achenes. Being self-pollinating *S. vulgaris*'s origin is still disputed. It is suggested that the plant is self-tetraploid originating from self-incompatible *S. vernalis* Waldst. & Kit. (Eastern groundsel, 2n = 20).The theory is based on the high fertility of hybrids produced between *S. vulgaris* and *S. vernalis* with morphological affinities, geographical distribution and hybridization in the wild. At the same time observed that *S. vulgaris* expresses disomy inheritance to all polymorphic loci with heterozygosity fixed (not self-segregate heterozygotes), indicating that it is faster by a allopolyploid. In another case, *S. vernalis* is considered as one of its parents. Hybridization of *S. vulgaris* with *S. vernalis* resulted in the formation of a hybrid short ligulate: *Senecio helwingii* Beger. & Hegi (2n = 30). Biochemical, *S. vulgaris* is regarded as hepatotoxic. The plant contains *pyrrolizidine alkaloids* (e.g, *senecionine*) that causes irreversible liver poisoning. In general, this group of toxic alkaloids are: *senecionsine*, *seneciphylline*, *retrorsine*, *riddellinem intergerrimine*, *spartioidine* and *usarmine*. *Senecio* genus name is probably derived from the word senex, an old man and refers to the appearance of downy achenes tip.

2. MATERIAL AND METHODS

Measurements were conducted in the later part of August on Senecio vulgaris plants in recent three years. They selected crops located in the resort area of research. Laboratory and field actions consisted of several stages.

Choosing samples

-they were chosen as winter cereals and spring crops
-in a crop was followed by a diagonal zig-zag, like the mapping scheme of weeds
-100 mature heads were harvested and placed in bags
-they were kept in the laboratory for constant humidity and maturation
-were determinated: the width of the capitulum disc, total ligule number, ligule length, number of achenes/ head, achene length and width, pappus length and style length (piece from the middle of pappus).

The histograms (frequency polygons,%)

-some determinations were like class intervals
-other determinations were used as such
-Excel program

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Correlations between characters
-were obtained the simple correlation coefficients (r)
-Excel program
Statistical analysis
-it was done on the strings of variation
-was used variance analysis, Anova test
-formulas used were:

$\bar{a} = \frac{\Sigma x}{n}$, ā = media, x = values obtained (1)

S^2 (variance) $= \frac{1}{n-1}\left[\Sigma x^2 - \frac{(\Sigma x)^2}{n}\right]$, (2)

S (standard error) = $\sqrt{S^2}$, (3)

S % (variation coefficient) = $\frac{s}{\bar{a}}100$ (4)

In the end it produced a synthesis of data on study characteristics variability of *S.vulgaris* fruit obtained by determinations.

3.RESULTS AND DISCUSSIONS

S. vulgaris variability of fruit characters. In mature stage the heads fall off, thus opening up fast and reveals the rich content in achenes with pappus. Globular appearance is quite compact, white. Shortly dissemination occurs. Of the head remains disc that gets a slightly crowned and ligules gather underneath it. Head disc diameter had size between 2.5 and 4.8 mm(figure 3). The modal value was 3.7-4.0 mm (42%), followed by those from 3.3-3.6 mm (21%) and 4.1-4.4 mm (20%). Extreme values accounted for only 2-3 % (2.5-2.8 mm and 4.5-4.8 mm). *S. vulgaris* appearance is characteristic of the heads discs and has been used in the wording of the comune 0ld-man-of-spring (figure 4).Number of ligules from a head was between 13 and 21. They dominated the 17 and 18 pieces (both 23%)(figure 5). The number of values in a head was observed a variance less constant. The cause can be both an environmental influence and genetic factors. Ligule length ranged from under 4.9 mm and over 7.4 mm(figure 6). They dominated those with 5.9-6.3 mm. And here was seen a little more pronounced volatility of this nature along determinations. May have multiple causes.

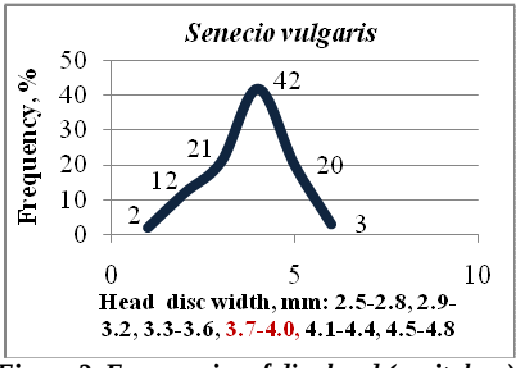

Figure 3. Frequencies of disc head (capitulum) width

Figure 4. Weed discs after dissemination

The plant is capable of producing a variety number of achenes, both in head and the whole plant. Their appearance is cylindrical, rough, with longitudinal grooves, dark brown color. From measurements showed that the highest frequency has a head with 51-60 pieces/head (31%). It was

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very close to the range of 61-70 achenes/head (30%). Heads with fewer achenes, 21-20 and 31-40 were 1% and 2% respectively. Heads with a great number of fruits (over 81) accounted for 3% of total (figure 7). The appearance of *S. vulgaris* achenes is characteristic (figure 8).

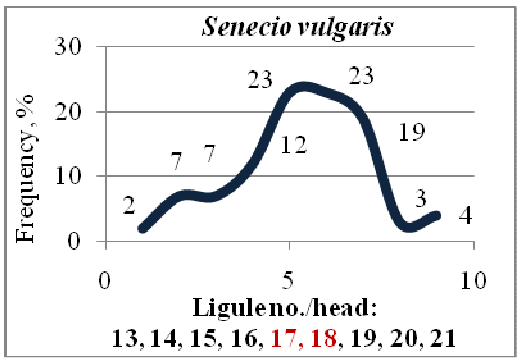

Figure 5. Frequencies of bracts number/head/capitulum

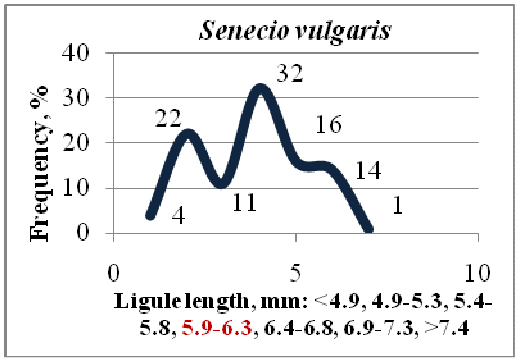

Figure 6. Frequencies of bracts length

Achenes dimensions are usually between 1.5-2.2 mm long and 0.7 mm wide. From measurements showed that there was a variability of achenes dimensions. Thus, the length of fruits was between 2.2 and 3.3 mm(figure 9). Dominant frequency was 35% to 2.8-2.9 mm lengths. Near it was the range 2.6-2.7 mm (31%). Achenes with shorter lengths of 2.2-2.3 mm were 3% of the total, while those with 3.2-3.3 mm 1% 0f the total. Achenes width was between 0.1 and 0.4 mm(figure 10). The dominated were those with 0.2 mm (56%), followed by the 0.3 mm (27%) and the 0,1 mm (14%). Fruits of 0.4 mm wide had frequency of 3%.

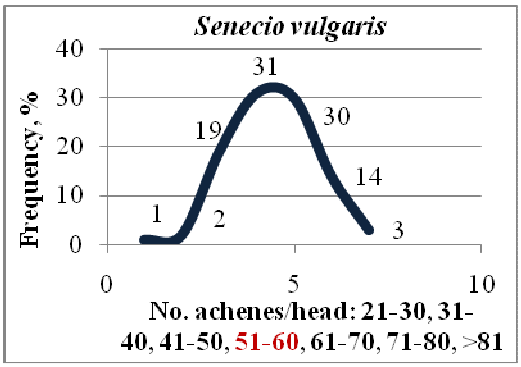

Figure 7.Frequencies of achenes number from heads

Figure 8. The fruits of S.vulgaris weed

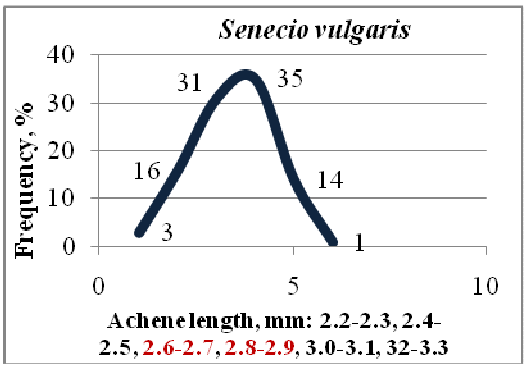

Figure 9.Frequencies of achenes length

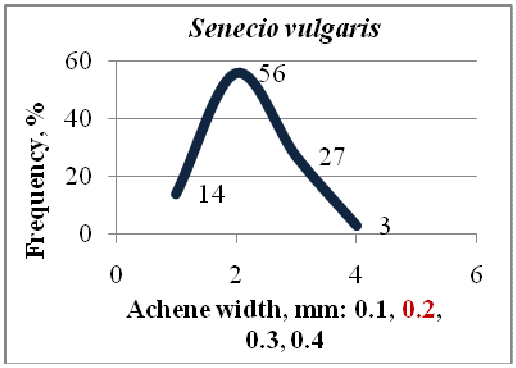

Figure 10. Frequencies of achenes width

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Among the *S. vulgaris* of fruit annexes are pappus and specific style. They are trapped in the top of achene and postrelease both pieces come off relatively easilly. Both components serve to spread the plant from the crops medium. From measurements revealed that in the separation moment, achenes with pappus and style relatively easy reach 2-3 meters away. Through wind speeds of 11-17 km.h^{-1} fruits reach considerable distances. Therefore, the weed is considered the most widespread species in the world. The assay consisted in measuring their length. Pappus from fruit (achene) is slightly longer than this, prominent, white, hairy and becomes sticky at high humidity. From measurements revealed that the pappus had lengths between 4.1 and 10 mm (figure 11). Pappus length frequency was highest within the class range 5.1-6 mm (42%). This was followed by pappus lengths of 6.1-7 mm (31%) and those with 4.1-5 mm (19%). Longer pappus of 7.1-8, 8.1-9 and 9.1-10 mm were 4%, 3% and 1% respectively of the total. The pappus appearance is a specific umbrella-shape(figure 12).The style ranged between 3.5 and 7.5 mm(figure13). Higher frequency had a style with 5-5.4 mm long (29%), followed by those with 6-6.4 mm (25) and those with 5.5-5.9 mm (23%). Styles of 3.5-3.9 mm were 1%, and of 7-7.5 mm 3%. The appearance of style at the top of *S. vulgaris* fruit is specific(figure 14).

Correlations between different characters analyzed. The fruits have shown quite different causal link between the observed characters(table 1). Of these characters stand out negative correlations between the ligule length with fruit width (r = -0.126^{0}), and the number of achenes from a head and pappus length (r = -0.262^{00}). This proves that longer ligules might influence smaller windths of fruits. In the second case as the number of achenes of head is higher, pappus will have lower lengths. The cause could be genetic aspect. Between positive links, obvious, are the width of the disc with fruit dimensions (r = 0.228* for length, r = 0.232* for width). The discs are the heads of larger diameter, so will form larger achenes.

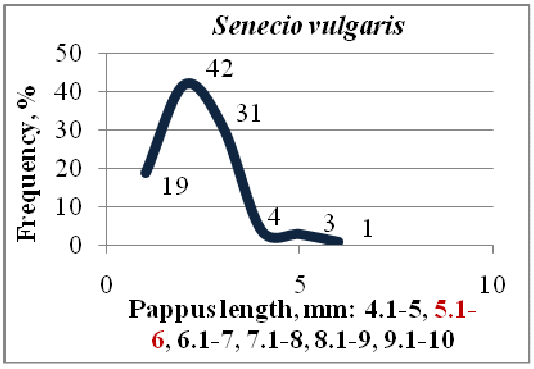

Figure 11.Frequencies of pappus length

Figure 12.S.vulgaris special pappus

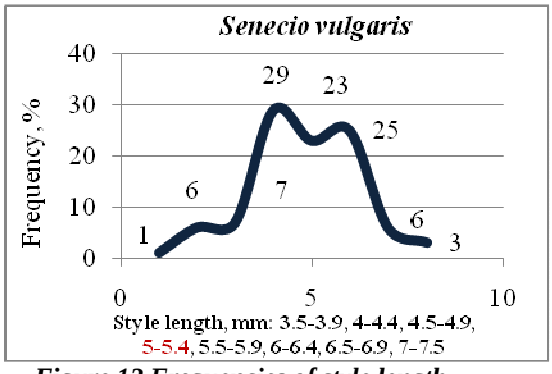

Figure 13.Frequencies of style length

Figure 14.S.vulgaris styles aspect

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***Table 1*. Correlations between fruit characters of *S. vulgaris* weed**

Character	Head disc diameter	Ligules number	Ligule length	No. achenes/ head	Achene length	Achene width	Pappus length	Style length
Head disc diameter	1	0.112	0.055	0.010	**0.228***	**0.232***	0.053	0.020
Ligules number		1	-0.171	0.105	-0.055	0.081	0.112	0.014
Ligule length			1	0.051	0.174	**-0.126^{0}**	0.094	0.137
No. achenes/ head				1	-0.064	-0.017	**-0.262^{00}**	-0.033
Achene length					1	0.145	0.056	0.182
Achene width						1	-0.097	0.089
Pappus length							1	0.014
Style length								1
LSD 5 % = 0.19 LSD 1 % = 0.25 LSD 0.1 % = 0.32								

Statistical analysis of the variability of *Senecio vulgaris* fruits. Were calculated for each character analyzed: the average (ā), the variance (s^2), the standard error of the mean (s), and the coefficient of variation (Cv,%). Statistical estimates made have highlighted the characteristic values of Senecio vulgaris ecotype of field crops. The values obtained were characteristic. Thus measured length of 3.76 mm head disc diameter. The total number of ligule was 17.3 and their length of 5.95 mm. Achene number per head was 59.6, and the size of achenes had length and width of 2.74 mm to 0.22 mm. Annexes of fruits have specific dimensions. Pappus measured on average 5.91 mm and style 5.59 mm (table 2).

***Table 2*. Statistical indices of *S.vulgaris* fruits variability**

Indices	Disc diameter	No. of ligules	Ligule length	No.achenes /head	Achene length	Achene width	Pappus length	Style length
Media, ā	**3.759**	**17.31**	**5.954**	**59.61**	**2.74**	**0.219**	**5.91**	**5.59**
Variance, s^2	0.1519	3.186	0.5785	131.61	0.6244	0.0040	0.8946	0.4555
Standard error, s	0.3897	1.785	0.7606	11.472	0.7902	0.0632	0.9458	0.6749
Variation coef., %	**10.37**	**10.31**	**12.77**	**19.25**	**28.84**	**28.86**	**16.00**	**12.07**

4. CONCLUSIONS

A widespread species that cause significant damage is *Senecio vulgaris* L. Eco-type from these south areas it is well adapted with the specific biology in all crops. To a control through its management's good to know as many morphological characters. Currently, it has been found that species expressing a wide variability could contribute to finding the most appropriate methods of control.

Morphological variability, especually reproductive one, being less known, could complete specific literature (table 3). Thus, mature head had disc diameter slightly smaller. Ligules number of surrendered basis were approximately normal, with somewhat greater length. Achenes head number has been consistent (between 28-94).

***Table 3*. The fruit characters variability of *S. vulgaris* weed**

Caracterul		Literature	Research
Head, capitula	Disc diameter, mm	6.0-7.0	2.5-4.8
	Ligule number	8-21	13-21
	Ligule length, mm	6.0	4.1-7.5
Fruit, achene	No/ head	-	28-94
	Length, mm	1.5-2.2	2.2-3.3
	Width, mm	0.7	0.1-0.4
	Pappus length, mm	-	3.9-7.0
	Style length, mm	-	4.0-9.3
	Thousand achenes weight, g	0.21	-

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Achenes were different dimensions: length much larger, but much smaller width. The medium pappus joined between 3.9-7.0 mm and lengtha style was 4.0-9.3 mm.

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